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HYDROACOUSTICS INC ROCHESTER N Y
CALIBRATION OF HLF-3 FOR 1978 SUMMER OPERATIONS.(U)
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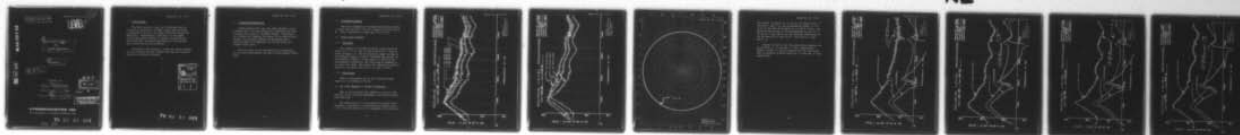
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CALIBRATION OF HLF-3
FOR
1978 SUMMER OPERATIONS.

11
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1.0 INTRODUCTION

The HLF-3 acoustic source was refurbished and the calibration verified at the NUSC Seneca Lake facility, in preparation for the 1978 Summer Operations aboard the USNS Lynch. Refurbishment consisted of a redesigned Wet-side Electronics package to improve reliability and serviceability, and design improvements to the pistons, motor mounts and suction strainers.

Calibration was required to verify the source performance and identify any gain changes that may have occurred during the electronic redesign.

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2.0 CALIBRATION DESCRIPTION

During operations at sea, the disk (radiator) accelerometers and a tow body mounted F-37 hydrophone are used to measure the output of the HLF-3 source. Calibration was performed by comparing the output of the disk accelerometers, the tow body mounted F-37 hydrophone and a calibrated NUSC F-37 Hydrophone in the far field for a constant input level.

The end result of the calibration is a sensitivity for the disk accelerometers and the tow body mounted hydrophone.

3.0 CALIBRATION RESULTS

HLF-3 was calibrated at the NUSC Seneca Lake facility on April 24th and 25th, 1978, at a depth of 316 feet (96.3 m). Water temperature at depth was 37° F (3° C).

3.1 SOURCE LEVEL RESPONSE

3.1.1 Far Field

The response of the HLF-3 acoustic source for drive levels of 0, -3, -6, and -12 dB V (0 dB V re 1 V rms) is shown in Figure 3.1. The accelerometer signal is used in the feedback circuit to help to linearize and flatten out the response of HLF-3. In the event of a fault in the accelerometer electronics, the source may be operated in an "open loop" mode. The "open loop" response is shown in Figure 3.2 for drive levels of 0, -6, and -12 dB V.

3.1.2 Directivity

HLF-3 is omnidirectional in the horizontal plane. Figure 3.3 is a pattern at 90 Hz.

3.2 FAR FIELD PRESSURE -- MONITOR COMPARISONS

Each of the following four figures is a plot of the response of the far field hydrophone, tow body F-37 hydrophone and disk.

The sensitivity of the tow body F-37 and disk accelerometers is determined by subtracting the monitor value in dB V from the Source Level as measured in the far field.

SENECA LAKE
DATE 4-24-1978
TIME 1758
TEMP 3°C
DEPTH 316 FEET

SOURCE LEVEL RESPONSE

UNIT HLF III SN MOD II

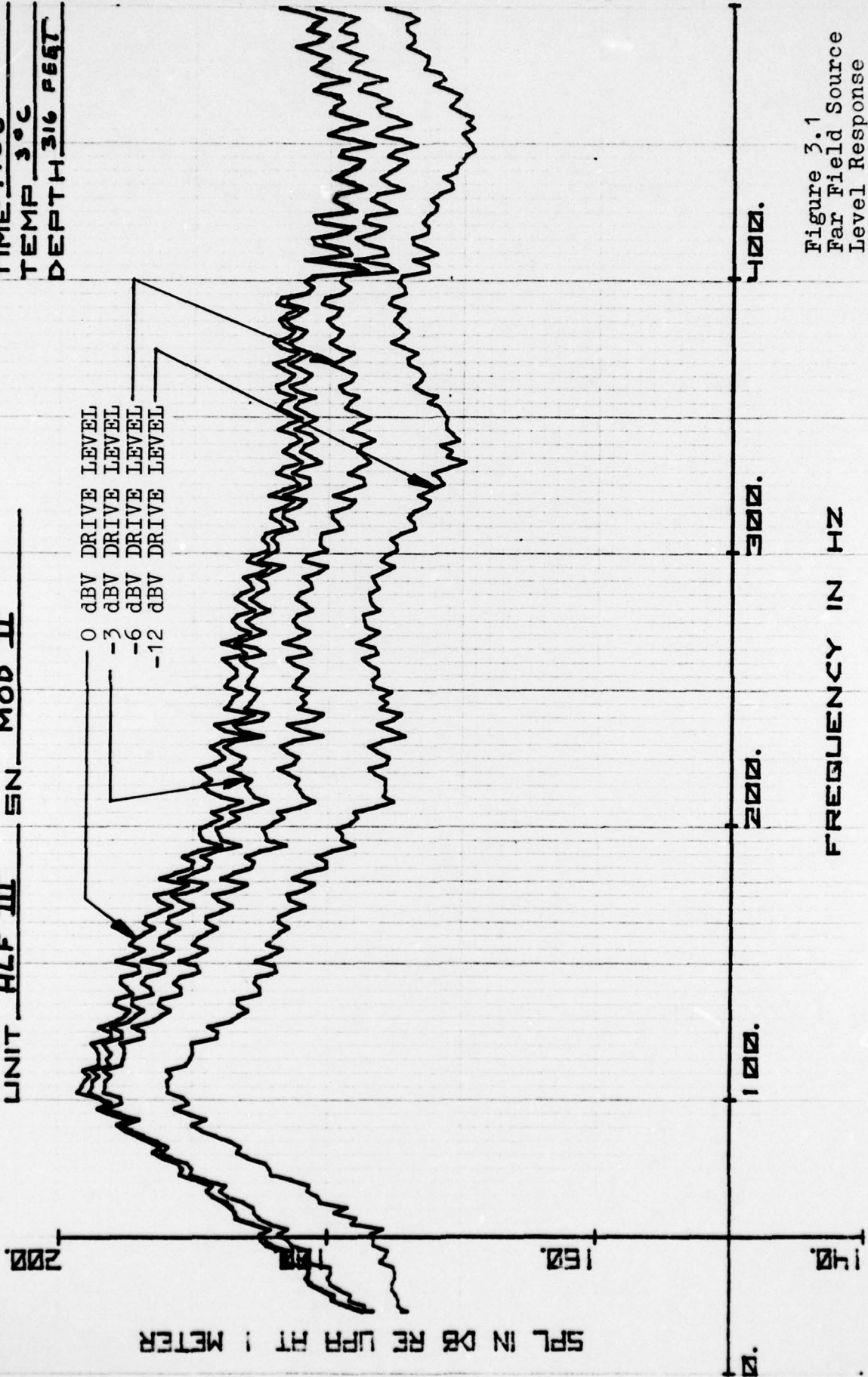


Figure 3.1
Far Field Source
Level Response

SENECA LAKE
 DATE 4-25-1978
 TIME 0857
 TEMP 3°C
 DEPTH 316 FEET

SOURCE LEVEL RESPONSE

UNIT HLF III SN MOD II

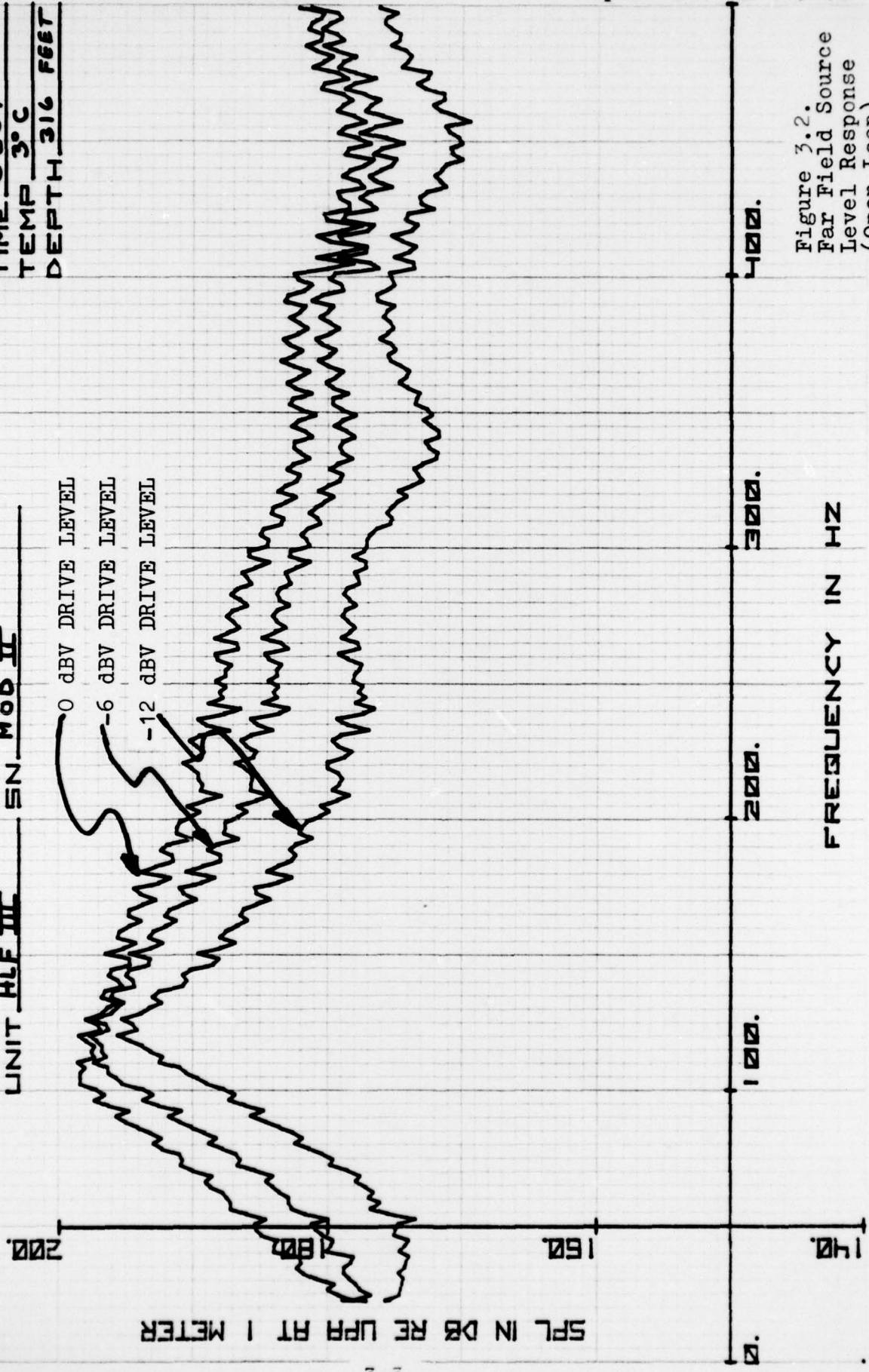
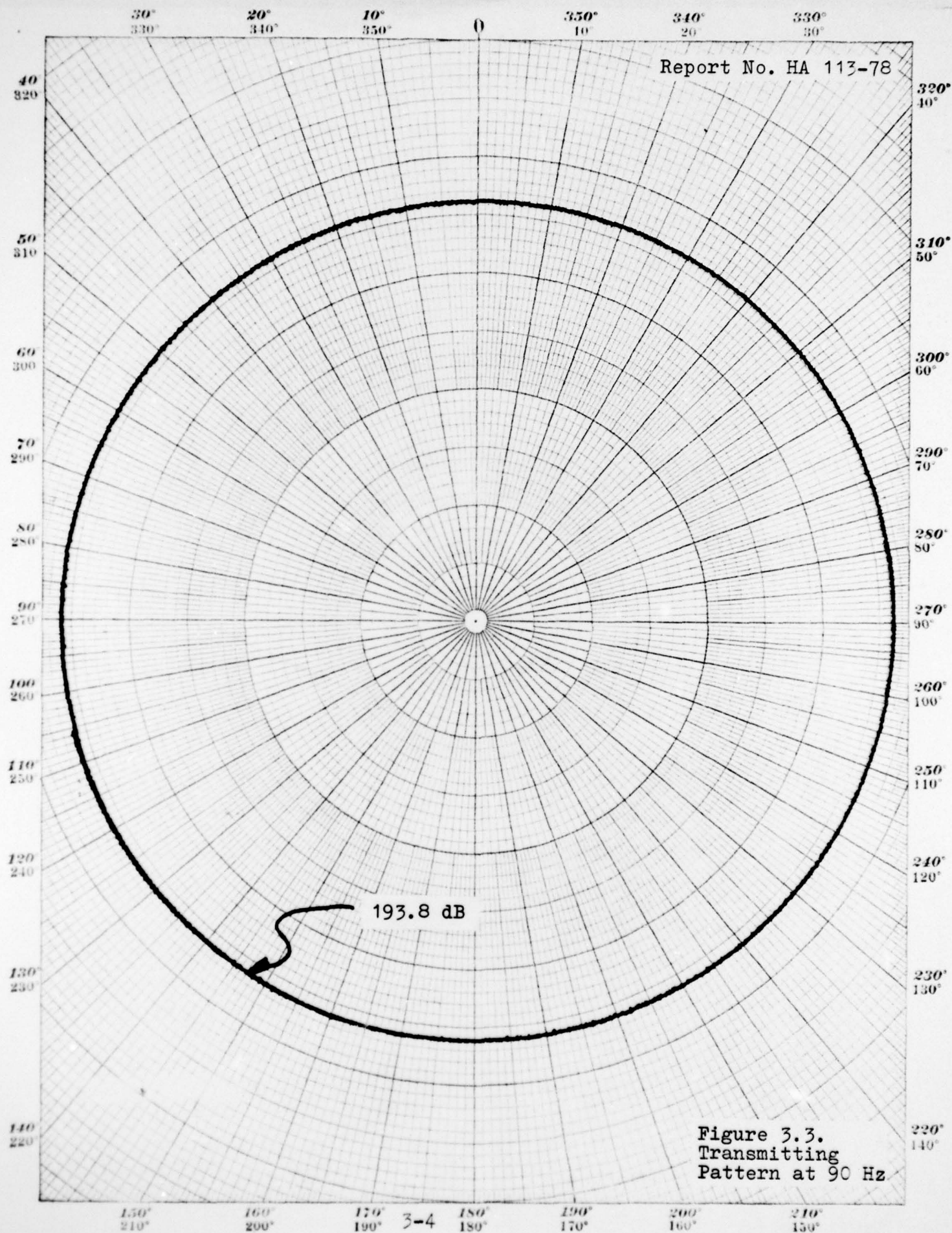


Figure 3.2.
 Far Field Source
 Level Response
 (Open Loop)



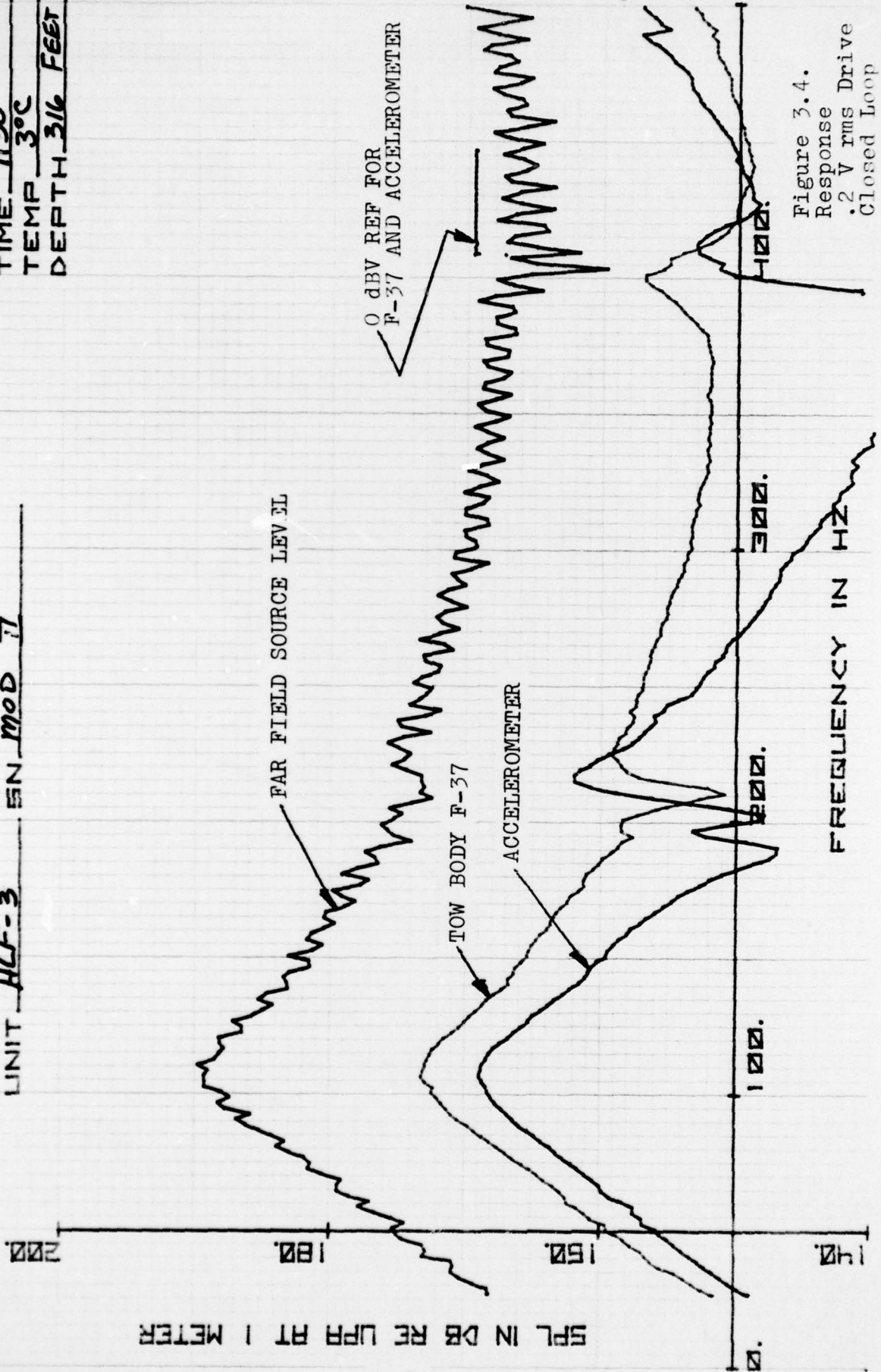
For example, in Figure 3.4 at 100 Hz, the Source Level is 188 dB re 1 uPa @ 1 m, the Accelerometer signal is -1.0 dB V; the Tow Body F-37 signal is +2.5 dB at 100 Hz. The effective sensitivity of the Accelerometer is $188 - (-1) = 189$ dB re 1 V per uPa @ 1 m; the effective sensitivity of the Tow Body F-37 is $188 - (2.5) = 185.5$ dB re 1 V per uPa @ 1 m.

Figures 3.4 and 3.5 are the source level response for drive levels of .2 V rms and .4 V rms, respectively. Figures 3.6 and 3.7 are the response for the "open loop" mode of operation at drive levels of .2 V rms and .4 V rms, respectively.

SENECA LAKE
DATE 4-25-78
TIME 1130
TEMP 3°C
DEPTH 316 FEET

SOURCE LEVEL RESPONSE

UNIT HLF-3 SN MOD 7



SENECA LAKE
DATE 4-24-1978
TIME 1740
TEMP 3°C
DEPTH 316 FEET

SOURCE LEVEL RESPONSE

UNIT HLF III SN MOD II

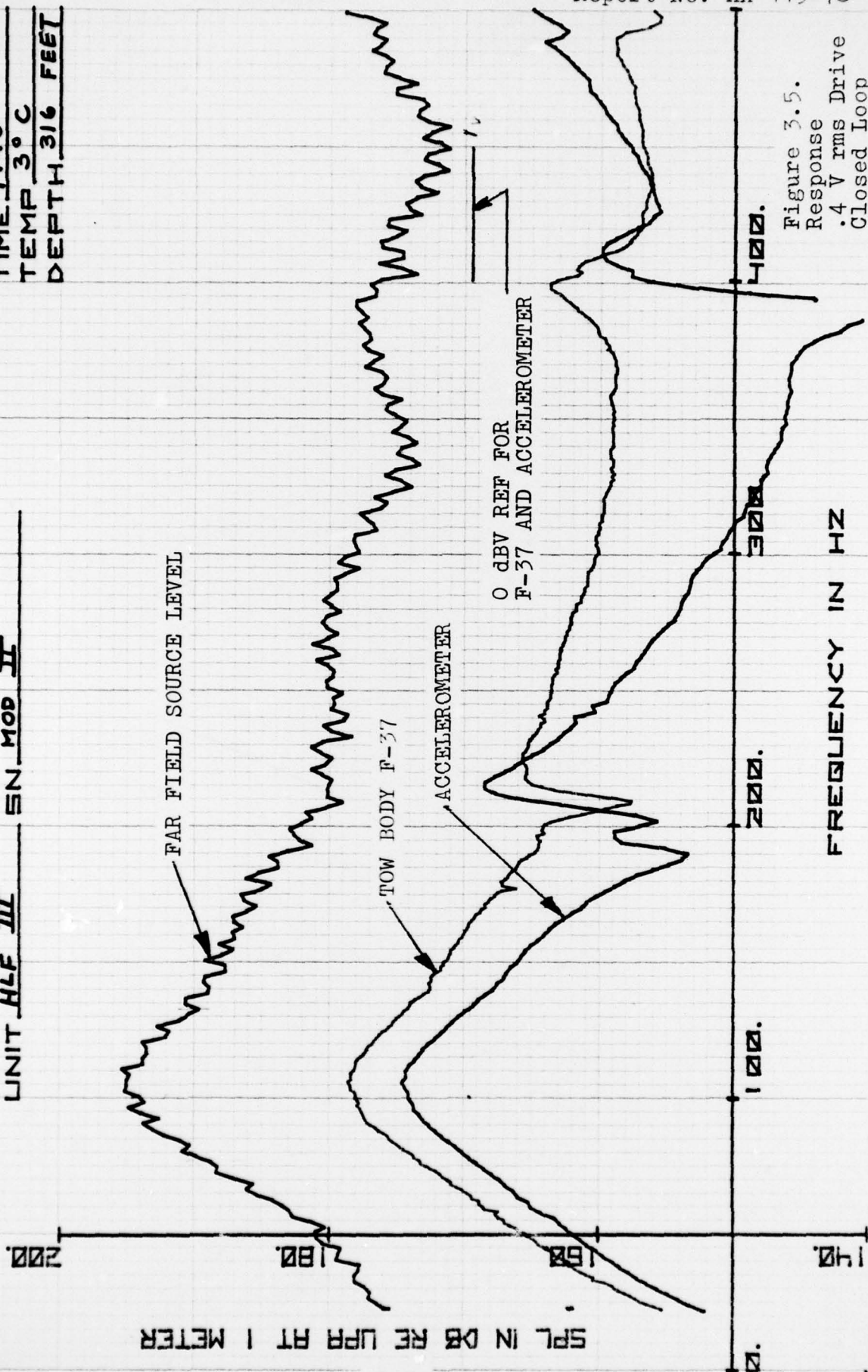
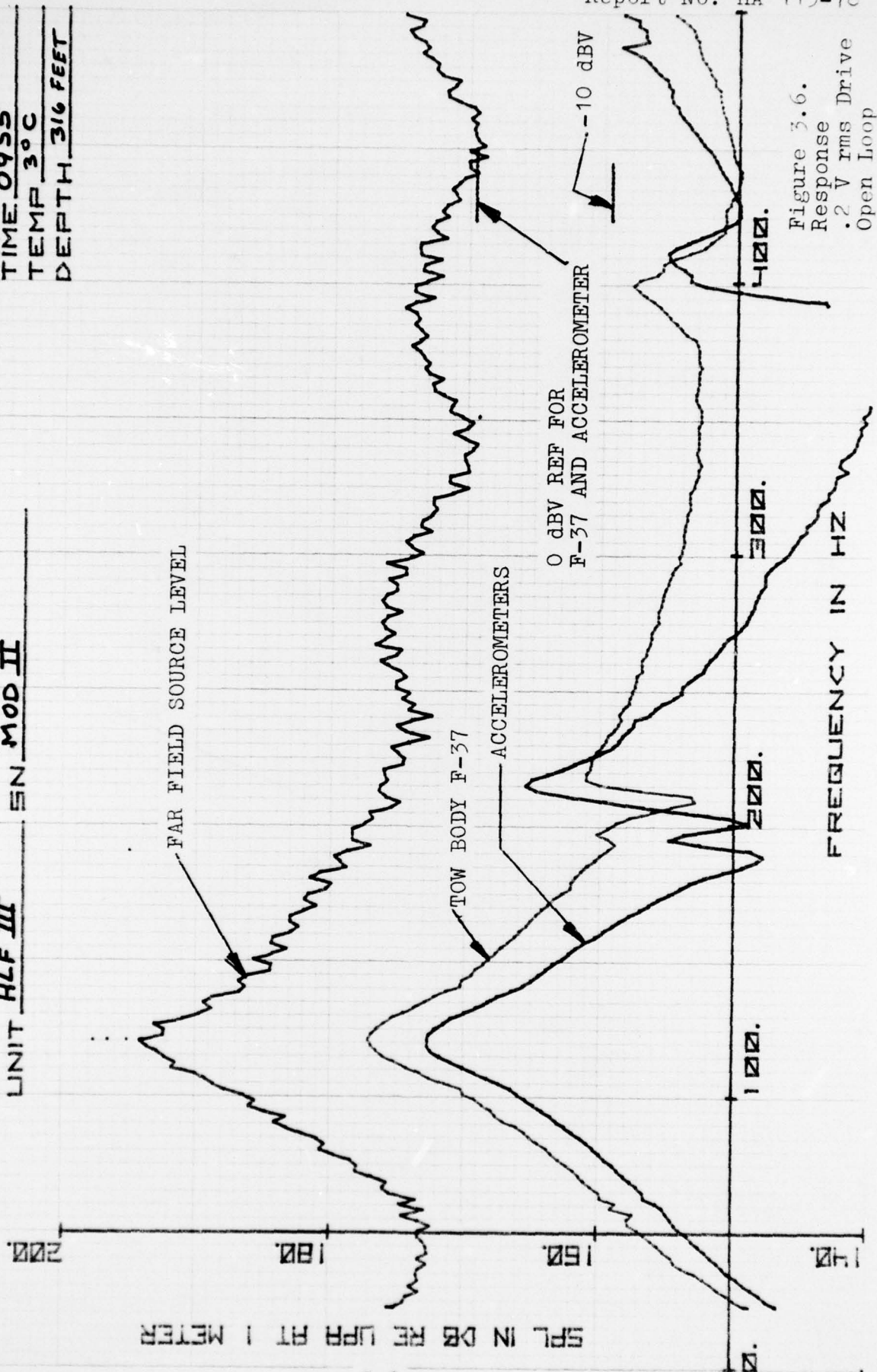


Figure 3.5.
Response
.4 V rms Drive
Closed Loop

SENECA LAKE
 DATE 4-25-1978
 TIME 0955
 TEMP 30C
 DEPTH 316 FEET

SOURCE LEVEL RESPONSE

UNIT HLF III SN MOD II



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Figure 3.6.
 Response
 .2 V rms Drive
 Open Loop

SENECA LAKE
 DATE 4-25-1978
 TIME 09 40
 TEMP 3°C
 DEPTH 316 FEET

SOURCE LEVEL RESPONSE

UNIT HLF III SN MOD II

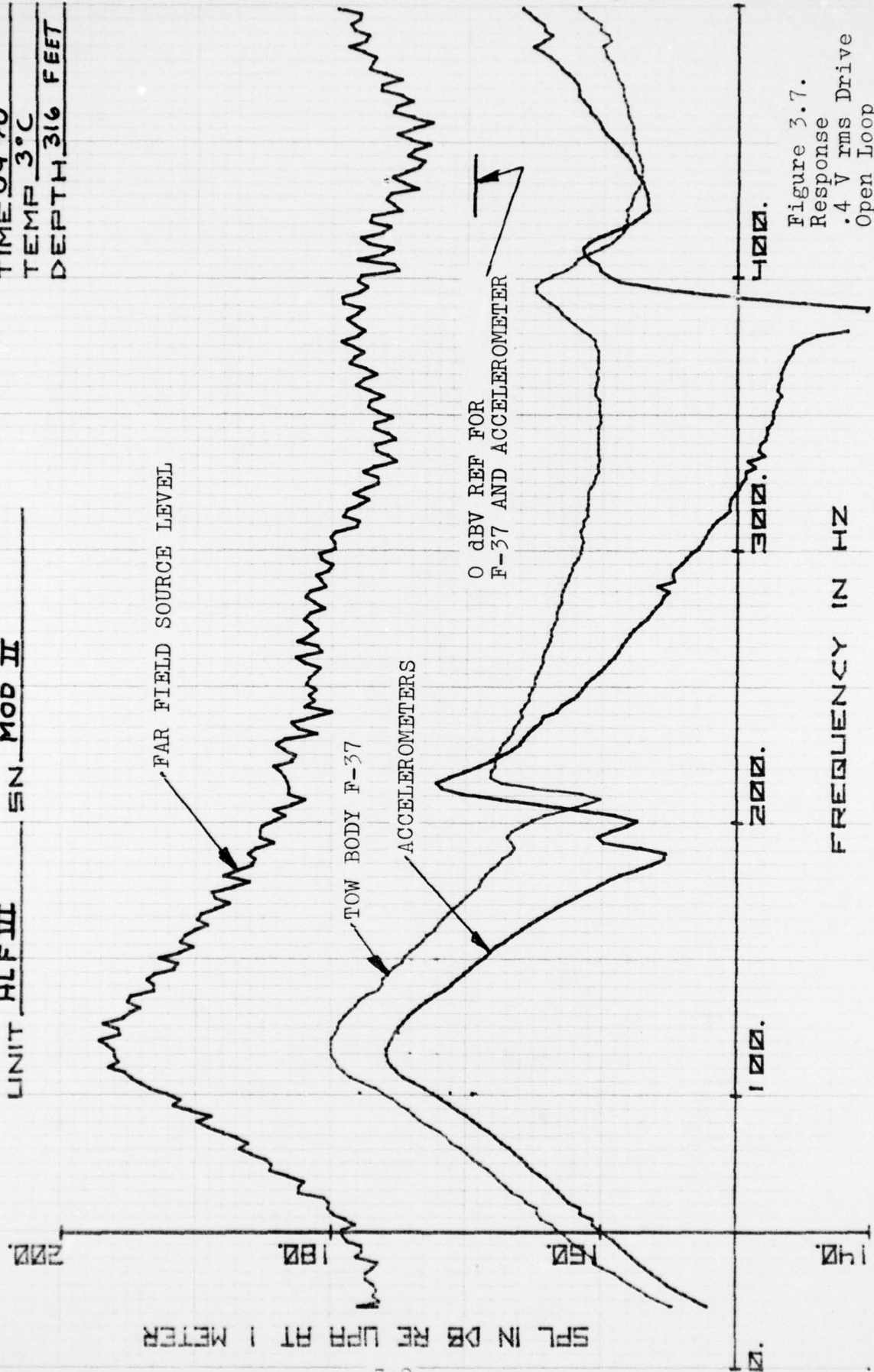


Figure 3.7.
 Response
 .4 V rms Drive
 Open Loop

4.0 SUMMARY

Using Figures 3.4 through 3.7, the tow body F-37 hydrophone sensitivity is $-185.5 \pm .5$ dB re 1 V per uPa @ 1 m and the disk accelerometer sensitivity is $-189.0 \pm .5$ dB re 1 V per uPa @ 1 m at the front panel. The theoretical sensitivity of tow body F-37 hydrophone is -186.2 dB re 1 V per uPa @ 1 m. More exact calibration values can be determined at each frequency of interest by subtracting the monitor reading in dB V from the Source Level.